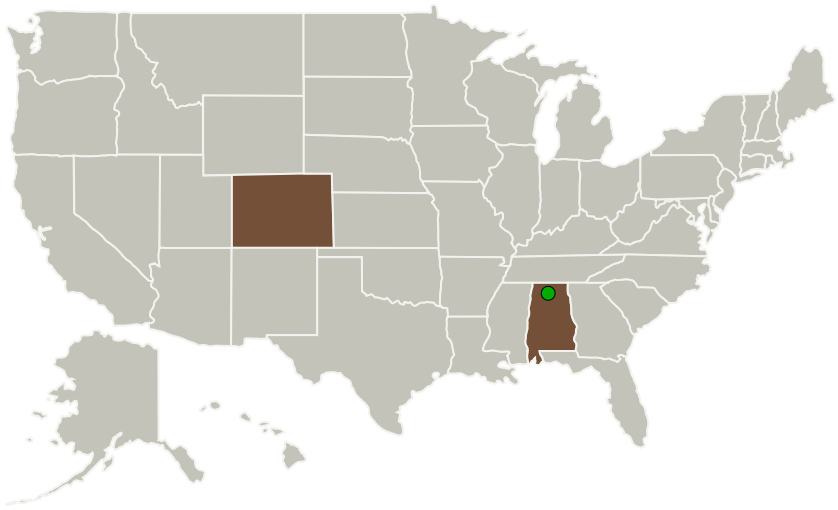
Cellular Load Responsive MLI: Structural In-Air and In-Space LH2 Insulation, Phase II

Completed Technology Project (2015 - 2018)

Project Introduction

Advanced space propulsion systems are a critical need for future NASA deep space missions. High thrust engines could revolutionize space exploration. Nuclear Thermal Propulsion ("NTP") is a high thrust/high Isp propulsion technology. Reduced or Zero Boil Off of LH2 propellant for long duration missions is among the critical technology advancements needed for cryogenic propellant storage for both NTP and chemical propulsion. Quest proposes to continue development of Cellular Load Responsive MLI (CLRMLI), an innovative, high performance thermal insulation system. CLRMLI is a novel technology with a cryopumping cellular core containing Load Responsive MLI layers. This new form of insulation uses cryosorption cryopumping to self-evacuate when in contact with cryogenic propellant tanks, allowing high thermal performance in-air and in-space. The Phase I program successfully demonstrated CLRMLI is a feasible and attractive insulation for new launch vehicle platforms and LH2 or LNG powered aircraft. CLRMLI has a measured heat flux of 11.4W/m2, 25X lower than SOFI (vacuum). NASA's Technology Roadmaps call "Zero Boil Off storage of cryogenic propellants for long duration missions" and "Nuclear Thermal Propulsion components and systems" the

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Quest Thermal Group	Lead Organization	Industry	Arvada, Colorado
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Colorado

Project Transitions

May 2015: Project Start

August 2018: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137497)*

Images

Briefing Chart
Cellular Load Responsive MLI: Structural In-Air and In-Space LH2 Insulation Briefing Chart *(https://techport.nasa.gov/image/127772)*

Final Summary Chart Image
Cellular Load Responsive MLI: Structural In-Air and In-Space LH2 Insulation, Phase II *(https://techport.nasa.gov/image/131881)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Quest Thermal Group

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Scott A Dye

Co-Investigator:
Scott Dye

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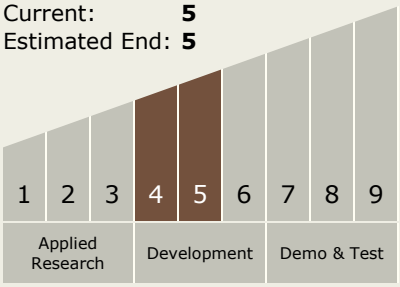
Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.2 Electric Space Propulsion
    - TX01.2.1 Integrated Systems and Ancillary Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System